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# Food and Feeding Habits of Indian Mackerel (*Rastrelliger kanagurta*) from Chaung Tha Coastal Area

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**Abstract**
The stomach content of *Rastrelliger kanagurta* was studied by regular monthly collection over the period of 10 months from January 2024 to December 2024. A total of 28 food items were recorded. Seven groups of food items, such as diatoms, dinoflagellates, larvae, algae, copepods, and miscellaneous items were recognized. The dominant diet in the stomach contents was diatoms and copepods. The most dominant items were *Chaetoceros* spp., *Coscinodiscus* spp., and copepod species, such as *Calanus sp and Eucalanus sp*. The analysis indicated that this species feeds mainly on diatoms (61.08%) and copepods (25.41%). The highest actively feeding intensity was observed at 76.5% in October, and the lowest actively feeding intensity was observed at 18.4% in July. 23.1-25.0 cm length group was recorded as the maximum actively feeding intensity (69%). The maximum feeding intensity was recorded in the maturity stage (49.5%), and the minimum feeding intensity was recorded in the ripe stage (15%).

**Keywords:** Copepods, diatoms, feeding intensity, maturity stages, *Rastrelliger kanagurta*

## 1. Introduction

*Rastrelliger kanagurta* is commonly known as Indian mackerel, and the local names of the *Rastrelliger* species are Pa-La-Tu. Indian mackerel is a major target species in Myanmar fisheries due to its ecological and economic importance. Artisanal fishermen rely on Indian mackerel fishing for their daily income.

Food is one of the key factors for growth, development, abundance, reproduction, survival, and the existence of life. The stomach content of *R. kanagurta* varies across the season: during the pre-monsoon, in high feeding, during the monsoon, moderate feeding, and during the post-monsoon, which is peak feeding. Feeding in *R. kanagurta* is strongly dependent on both gonad development and fish size. Temperature, salinity, and plankton density influence feeding intensity. Dietary variation is fluctuations in food sources, and the main determinants of diet can be considered fish size, food preference, and frequency of hunting (Link and Garrison, 2002).

The food items are identified and sorted into various taxonomic groups, and the numerical percentage is estimated. The food items are identified and sorted into taxonomic groups, and the numerical percentage is estimated. The numerical method of the total number of individuals of each food item and the percentage frequency occurrence of food organisms in the stomachs (Hyslop, 1980). The number of points depends on whether the organism is in the stomach contents (the highest number of points) or rare (the lowest number), and on the size of the organisms. The stomach is described according to the amount of food it contains as: full, ¾ full, ½ full, ¼ full, less than ¼ full, empty or trace (Dadzie et al., 2000).

The objective of the present study was to identify the food items in the diet of *Rastrelliger kanagurata* and classify them into diatoms, dinoflagellates, copepods, algae, larvae, and miscellaneous matter. Determine the percentage composition of these items using numerical and occurrence methods, the feeding intensity in relation to different size groups and seasons and understand the relationship between feeding activity and fish maturity stages.

## 2. Material and Methods

*Rastrelliger kanagurta* was collected monthly from the Chaung

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Tha Coastal Area, Pathein Township, Ayeyarwaddy Region (Fig. 1) from January 2024 to December 2024. Purse seine and gill net were used to catch *Rastrelliger kanagurta* in the study areas. Total length and fork length were measured with an accuracy of 0.5 cm, total body weights and stomach weights of the sample fish were measured with an accuracy of 0.1g using a digital balance. Stomach was carefully taken out and fixed in 5% formalin. The total volume of the gut contents was determined by the displacement method. Then the stomach contents of food items were diluted to 10 ml, and out of this sub-sample of 1 ml, a graduated pipette was used to examine in detail, spread over a counting slide. It was examined under a binocular microscope and analyzed by the Numerical Method.

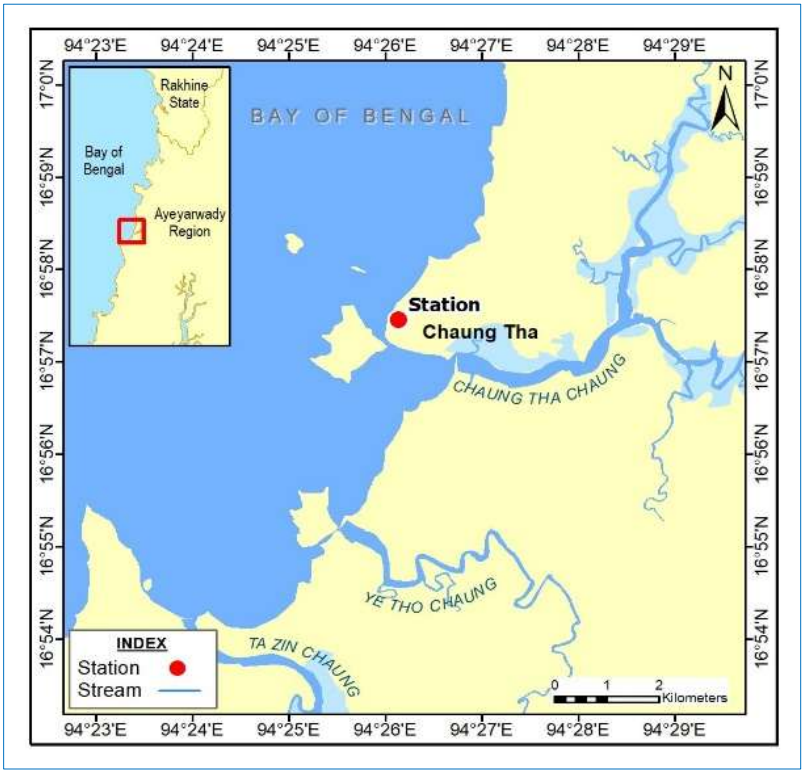


Fig. 1. Study area of Chaung Tha Coastal Area

### *2.1. Food Items Analysis of Gut Contents*

The stomach content of each fish was made up to a known volume (10 mL) by adding water into the measuring cylinder to determine the volume of contents. After mixing well, 1 mL of the sub-sample was taken by pipette, and the components of the food items were analysed under the microscope. Feed items were identified at each level wherever possible by various references. The stomach contents were identified into broad but exclusive categories like copepods, diatoms, dinoflagellates, larvae, algae, and miscellaneous. The identifications of plankton were mainly based on the classification system used by Veriencar et al. (2004) and Slotwinski et al. (2014). After that, food items were grouped into major categories.

### *2.2. Food Composition*

Number method: The number of individuals of each food type in each stomach is counted and expressed as a percentage of the total number of food items in the sample studied, or as a percentage of the gut contents of each specimen examined, from which the total percentage composition is estimated.

$$\text{Percent by number, } N_i = \text{Number of individual food items} / \text{Total number of different food items} \times 100 \quad (1)$$

### *2.3. Feeding Intensity*

The feeding intensity was studied by the degree of fullness in the stomach, and the stomach emptiness index was calculated. The stomach emptiness index was used to estimate the fish's appetite and the feeding intensity. The feeding intensity was assessed based on the distension of the stomach contents, classified as full, ¾ full, ½ full, ¼ full, and empty.

## 3. Results and Discussion

### *3.1. Food Items of Rastrelliger kanagurta*

A total of 28 food items were observed in the stomach of *Rastrelliger kanagurta* from the Chaung Tha Coastal Area.

### *3.2. Food composition of Rastrelliger kanagurta*

The analysis of gut content shows that diatoms and copepods formed the main food. The average percentage composition of the gut contents for the entire duration of the study were approximately diatoms (61.08%), dinoflagellates (6.23%), larvae (3.78%), copepods (25.41%), algae (3.27%), and miscellaneous items (1.71%) from Chaung Tha coastal area. Monthly percentage compositions of different food items are presented in Fig. 2. Monthly percentage composition of *R. kanagurta* from the Chaung Tha coastal area, phytoplankton were the majority of food items of *R. kanagurta* during the

present study period. The percentage of diatoms was highest in November (67.8%) and the lowest in July (56%). Higher quantities of diatoms appeared in October (65%), November (67.8%), December (66.6%), January (61.3%), and February (60.3%). The highest percentage of dinoflagellates was recorded in March (7.5%). Copepods formed a second portion of the food that occurred during the study period. Their highest percentage (30.8%) was in August, and the lowest quantity of these items was found in November (19.1 %). However, bivalve larvae, Gastropod larvae, and fish larvae were found in June, July, August, and September.

Only one taxon of Algae was found in the stomach content of *R. kanagurta*, the highest percentage in January (5.8%). Miscellaneous items were recorded for four items; the maximum percentage occurred in June (2.6%), and the minimum percentage in March (1.2%). Bagheri et al. (2013) reported similar observations that phytoplankton (45%) is the essential food item of *R. kanagurta* in the Hormozgan province water, Persian Gulf. Parkayastha et al., (2023) described the Indian mackerel gut contents of fish scales (48%). Dhuri and Kamble (2025) described the primary food sources of *R. kanagurta* gut contents as 44.11% zooplankton, 39.68% phytoplankton, 2.99% algae, 9.48% miscellaneous matter, and 3.71% semi-digested matter. Dhuri and Kamble (2025) reported that the percentage composition of the miscellaneous food matter was 9.48%.

Table 1. Food items of *Rastrelliger kanagurta* stomach contents from Chaung Tha Coastal Area

| Main food categorized | Food groups | Food items |
|---|---|---|
| Phytoplankton | Diatoms | *Amphora* sp |
| | | *Nitzschia* spp |
| | | *Bacteriastrum* spp |
| | | *Coscinodiscus* spp |
| | | *Navicula* sp |
| | | *Rhizosolenia* sp |
| | | *Chaetoceros* spp |
| | | *Ditylum* spp |
| | | *Biddulphia* sp |
| | | *Hemidiscus* spp |
| | | *Thalassionema spp* |
| | Dinoflagellates | *Peridinium* sp |
| | | *Dinophysis* sp |
| | | *Ceratium* spp |
| | | *Noctiluca* sp |
| | Larvae | Bivalve larvae |
| Zooplankton | | Gastropod larvae |
| | | Fish larvae |
| | Copepod | *Euterpina* sp |
| | | *Favella sp* |
| | | *Copilia sp* |
| | | *Calanus* sp |
| | | *Eucalanus sp* |
| | | *Oithona* sp |
| Algae | | Algae |
| Miscellaneous item | | Scales |
| | | Fish egg |
| | | Semi-digested matter |

Table. 2. Monthly food composition of *Rastrelliger kanagurta* from the Chaung Tha Coastal Area

| Month | Diatom | Dinoflagellates | Larvae | Copepod | Algae | Miscellaneous item |
|---|---|---|---|---|---|---|
| Jan | 61.1 | 7.4 | | 23.9 | 5.8 | 1.8 |
| Feb | 60.3 | 6.6 | | 26.2 | 5.6 | 1.3 |
| Mar | 57 | 7.5 | | 29 | 5.3 | 1.2 |
| June | 57.7 | 7.3 | 6 | 25.9 | 0.5 | 2.6 |
| July | 56 | 6.7 | 6.9 | 27.8 | 0.8 | 1.8 |
| Aug | 59 | 4.7 | 3.5 | 30.8 | 0.3 | 1.7 |
| Sep | 59.9 | 6 | 2 | 29.7 | 1 | 1.4 |
| Oct | 65 | 6.2 | 0.5 | 23 | 3.5 | 1.8 |
| Nov | 67.8 | 6.4 | | 19.1 | 5 | 1.7 |
| Dec | 66.7 | 4.8 | | 22.3 | 4.9 | 1.3 |

### *3.3. Feeding Intensity Relation to Months*

The monthly percentage of *Rastrelliger kanagurta* from the Chaung Tha Coastal Area actively fed was found to be the lowest at 18.4% in July and the highest at 76.5% in October. The monthly percentage of moderate feeding intensity varied from a minimum of 13% in October to a maximum of 42.3 % in September. The poorly feeding intensity was high in July (40.1%) and low in October (10.5%). The results of the current study show that the highest feeding intensity was observed in October. During November, a high feeding intensity was recorded, but slightly lower than in October. Moderate feeding intensity was noticed during June, July, August, September, and March. Poor feeding intensity was observed during March, June, July and August. Daghooghi et al. (2018) showed that 21.3% of stomachs were full, 44.5% were semi-full, and 34.2% were empty. The feeding activity was found to reach its maximum level during September, October, and November when most of the fish were in spent and recovering condition (Daghooghi et al, 2018). Different results were obtained for the feeding intensity of *R. kanagurta* from the Coast of Goa (Shalma and Shanaya, 2023), the highest feeding intensity was observed in December, with 66.6% of the stomach filled, and the lowest in April (4.6%). A similar result, peak feeding intensity occurred in October and November, while monthly feeding intensity was reduced from April to July (Dhuri and Kamble, 2025).

### *3.4. Feeding Intensity Relation to Length Groups*

The percentage occurrence of feeding intensity in relation to length group of *Rastrelliger kanagurta* from the Chaung Tha coastal *area* was presented in Fig. 3. The percentage of actively fed fish was found to be highest in the 23.1-25.0 cm group (69%) and lowest in the 27.1-29.0 cm group (14%). Moderate feeding was recorded in all length groups, comprising 30.2% (19.1-21.0 cm), 39% (21.1-23.0 cm), 21% (23.1-25.0 cm), 39.5% (25.1-27.0 cm), and 31% (27.1-29.0 cm). The fish fed poorly was found in all length groups, with the minimum percentage ranges of 10% in the 23.1-25.0 cm group and a maximum of 55.0% in the 27.1-30.0 cm group. They were present in the gut practically throughout the fish

length group, and the maximum feeding of them was from 23.1 to 25. A higher percentage was observed in the size range 23-25 cm (9.86%). (Shrinivas et al., 2013). Bhendarkar (2014) recorded that the phytoplankton were dominant only in the size range 16- 18 cm (40.64%) and 14-16 cm (40.25%).

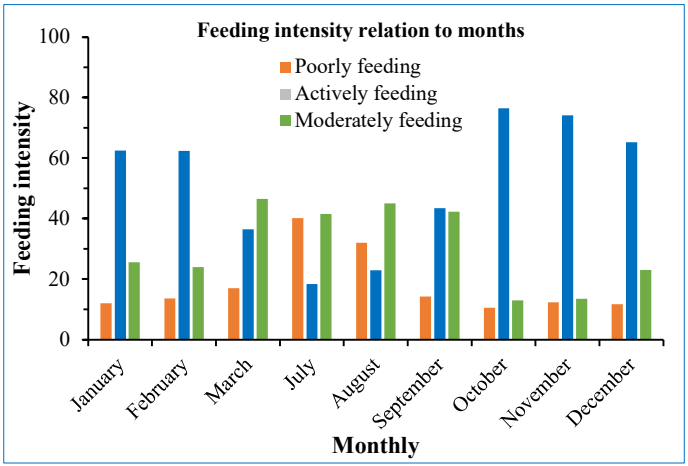


Fig. 2. Feeding intensity relation to months of *Rastrelliger kanagurta* from the Chaung Tha Coastal Area

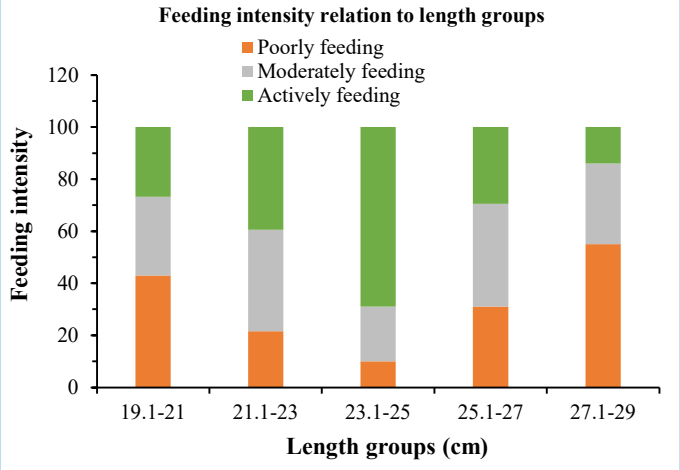


Fig. 3. Feeding intensity relation to length groups of *Rastrelliger kanagurta* from the Chaung Tha Coastal Area

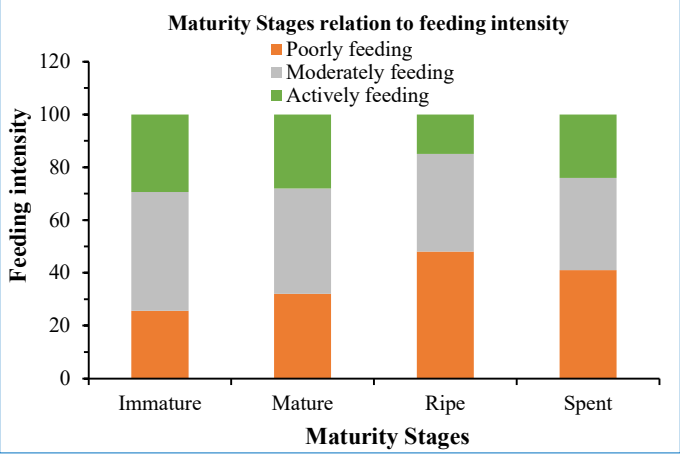


Fig. 4. Feeding intensity relation to the maturity stage of *Rastrelliger kanagurta* from the Chaung Tha Coastal Area

### *3.5. Feeding Intensity Relation to Maturity Stages*

The percentages of feeding intensity, active, moderate, and poor feeding in *R.kanagurta* during the immature stage were 29.4%, 45% and 25.6% respectively. The highest feeding intensity of fish (23.5%) was observed in the mature stage, and 49.5% of mature fish fed actively, and 27% of fish fed poorly. The percentages of fish in actively, moderately, and poorly feeding were 15%, 37% and 48% of fish, respectively for the ripe stage of fish. The occurrences of actively, moderately, and poorly fed stomachs in the spent stage of fish were 35%, 24% and 41% respectively. A similar result was observed by Nobel (1957) in which mackerel at Karwar feed well when they are immature (Stage I), start maturing (Stage II), where feeding also increases, and in Stage III of maturity, it is observed to be highly intense. The feeding of gonad maturing (Stage II) in *Rastrelliger branchysoma* from Palaw and adjacent coastal waters, Tanintharyi region was high, and at Stage III of maturity, it becomes highly intense (Aye, 2020).

## 4. Conclusions

The species *Rastrelliger kanagurta* were examined to analyse their food and feeding habits from January to December 2024. A total of 28 food items were recorded. The stomach contents mainly consisted of diatoms, dinoflagellates, larvae, algae, copepods, and miscellaneous items. According to the results of percentage composition, it can be concluded that *Rastrelliger kanagurta* is a plankton feeder. According to the analysis of stomach condition, *Rastrelliger kanagurta* has active feeding habitats.

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